

Journal of Anatomy and Physiology.

ON THE TOPOGRAPHICAL ANATOMY OF THE ABDOMINAL VISCERA IN MAN, ESPECIALLY THE GASTRO-INTESTINAL CANAL. By CHRISTOPHER ADDISON, M.D., B.S. (Lond.), F.R.C.S., *Professor of Anatomy, University College, Sheffield*.¹ PART II. (PLATES LII.-LIV.)

(Continued from page 586, vol. xxxiii.)

TABLE III.²

Table of Average Relations of the Stomach to the adjoining Viscera, and accessory Tables relating thereto.

(Compiled from Tables II., III., V., and VI. in the Appendix. All measurements in centimetres.)

The liver.

The upper border in the R.L. line as to E.F.,	10·4 cm. above.
" " as to inf.-ster. notch,	6 cm. above.
" M.L. " " "	8 cm. below.
" " " E.F.,	9 cm. above.
The left extremity of the liver from M.L.,	7·1
" " " above E.F.,	7·4
The extent that the liver overlaps the stomach in the	
³ plane of the left point of the lesser curvature,	1·43
The extent that the liver overlaps the stomach in	
M.L.,	1·6
The extent that the liver overlaps the upper border	
of the pylorus,	1·8

¹ In reading this paper, reference should be made to figs. 1 and 3 and the Plates in Part I.

² For convenience, it may be repeated that R.L., L.L., and M.L. indicate respectively, the right lateral, the left lateral, and the middle lines, and that E.F. is a line drawn transversely across the body, midway between the pubes and the supra-sternal notch.

³ The points are defined in the text.

The outer point of the left kidney as to E.F.,6 below.
The lower pole	" "	6.2 "
" "	" " as to the <i>iliac crest</i> ,	3.3 above.
The lowest point of the left supra-renal as to E.F.,		.5 "
The highest	" "	5.5 "

The spleen.

¹ Distance to the left of the lowest 'point' of the anterior border of the spleen,	11·5
The lowest point of the spleen as to E.F.,	1·4 below.
The highest point of the spleen as to E.F.,	8·7 above.
The " " " infra-sternal notch,	1·1 below.
The highest point of the spleen from the middle line,	5·8
The innermost point of the spleen from the middle line,	3·6

II. AVERAGE POSITION OF THE STOMACH IN RELATION TO OTHER ORGANS.

In this place the average position of the stomach in relation to the adjoining viscera in the whole series will be stated. It is, however, fully recognised that in some cases, especially with regard to the transverse colon, and to some less extent the liver, the mere statement of an average does not sufficiently indicate what we should expect to meet with in any particular case.

The Liver.—The upper border of the liver in the middle line is situated 8 cm. below the infra-sternal notch, and 9 cm. above E.F., passing across, that is, a little higher than the upper border of the cardiac orifice. It passes to the left, in front of the stomach, for 7.1 cm., sinking in level 1.6 cm. The left extremity of the liver is therefore situated 7.4 cm. above E.F., 7.1 cm. from the middle line; or, in general terms, 3 inches to the left of the middle line 1 inch below the level of infra-sternal notch; or behind the sixth rib near the costochondral junction. The summit of the stomach, on a posterior plane, projects 2.2 cm. higher than this left part of the liver.

¹ The anterior border of the spleen sometimes passes imperceptibly into the basal surface. The point had then to be selected arbitrarily.

The *lower border of the liver*, passing from its left extremity towards the right, sinks but little in level for its first 2 cm., after which it bends almost directly downwards, with a convexity to the left and downwards, until in the plane of the 'left point' of the lesser curvature the liver overlaps the stomach for 1.43 cm.; the margin of the liver in this plane being 5.18 cm. from the middle line, and 4.5 cm. above E.F. From this point the lower margin of the liver follows fairly regularly the lesser curvature, overlapping it in the middle line 1.66 cm. and at the upper margin of the pylorus 1.8 cm.

The lower border of the liver in the middle line is .3 cm. above E.F.; the vertical depth of its anterior surface in the middle line thus being 8.7 cm.

The Transverse Colon.—The upper border of the transverse colon crosses the middle line 3.2 cm. below E.F., being nearly in contact with the lower border of the stomach.

Continued to the left, in a great many cases there is a loop of colon passing, either upwards in front of the stomach, or downwards, in the interval between the middle line and the left lateral line. In the left lateral line the upper border of the colon is 1.3 cm. below E.F. in contact with the lower border of the greater curvature of the stomach, having risen 2 cm. in level from the middle line. Continued to the left as far as the point designated the 'left point' of the greater curvature, the colon forms a loop upwards before bending backwards at its splenic flexure. The middle of the highest part of this terminal loop upwards of the transverse colon (see fig. 3A, Part I.) practically corresponds to the left point of the greater curvature of the stomach. In most cases the mutual pressure of the two viscera, supported by the small intestines and general abdominal pressure below, and pressed upon by the diaphragm and liver above, determines where shall be the left point of the greater curvature. The precise situations of these two 'points' are—of the highest point of the splenic bend of the colon, 2.9 cm. above E.F., and 10 cm. from the middle line; of the left point of the greater curvature, 3.5 cm. above E.F., and 10.7 cm. from the middle line.

The upward bend of the transverse colon to the left is thus 4 inches from the middle line, and rather over 1 inch above E.F.

The part of *the anterior surface of the stomach* which is not covered by the liver or the diaphragm (fig. 3A), and which is more or less in contact with the anterior abdominal wall, may be roughly defined as a triangular area having for its base a line passing 1.5 cm. below E.F., beginning 2.5 cm. to the right of the middle line, and continued across to the left costal margin; the apex of the triangle being along the left costal margin, 3 cm. above E.F.

Concerning the posterior relations of the stomach, a general description is necessary before giving the averages.

The parts behind the stomach in the hardened specimen, or in a good fresh subject, present a well-marked and regular concavity for the reception of the cardiac portion of the stomach, which Birmingham (6) aptly described as the 'stomach-bed.'

When the stomach is removed the convexity of the central part of the diaphragm downwards, produced by the heart, is seen. Passing to the left, this convexity passes into the concavity which lodges the summit of the stomach, and which projects, as a rule, 1 cm. higher than the highest point of the spleen. The concavity of the diaphragm, continued either from above downwards or from the left inwards, passes into the hollow of the gastric surface of the spleen; this gastric surface of the spleen forming, with the diaphragm, the completion of the outer wall and a part of the floor of a deep concavity which projects backwards to a plane, up to 6 cm., posterior to the front of the aorta and the pancreas in the middle line. The floor of this concavity is completed, below the innermost part of the spleen, by a portion of the anterior surface of the left kidney at its upper part, the extent of this gastric surface of the left kidney being determined by the size of the spleen, and by the degree of displacement of the pancreas, as will be subsequently shown. Lying over the inner part of this portion of the kidney, and completing the floor of the stomach-bed at this part, and continuing it inwards to the side of the vertebræ, is a varying part of the left supra-renal capsule projecting above the upper border of the pancreas.

The extent of the gastric surface of the left supra-renal capsule is determined partly by the position of the convolutions of the splenic artery, which often quite overlap it, partly by

the size of the pancreas and the spleen, and partly by the position of the pancreas. When the pancreas is pushed upwards by the intestines below, or downwards by the stomach above, it sometimes carries the supra-renal body with it a certain extent. Moreover, when the upper portion of the spleen is enlarged, it spreads downwards over the gastric surface of the left supra-renal as well as over that of the adjoining kidney and shuts them out from relation with the stomach.

The concavity of the stomach-bed passes downwards from the hilum of the spleen, and from the gastric surfaces of the left kidney and supra-renal capsule, on to the gastric surface of the pancreas. The slope of the gastric surface of the pancreas is directed downwards and forwards, with varying degrees of obliquity, to the lower, or, more correctly, the anterior border of the gland. The degree of obliquity of the gastric surface of the pancreas is determined, with a pancreas of average size, by the pressure of the stomach above, and of the jejunum and intestines on the inferior surface of the pancreas below.

If the stomach is large, it tends to flatten the pancreas; and if it is large and lowly placed, it tends not only to flatten out the pancreas, but also to push it downwards over the face of the left kidney, with perhaps the left supra-renal capsule. On the other hand, if the intestines are distended, particularly the jejunum, they tend to push the pancreas bodily upwards over the left kidney, so that the gastric surface of the kidney may become obliterated, and, moreover, at the same time the anterior border of the pancreas is pressed upwards so that the inferior surface looks first directly downwards, then downwards and forwards; the slope of the gastric surface thus running increasingly forwards, the pancreas forming more and more a projecting ledge on which the stomach rests, not only posteriorly, but inferiorly. Furthermore, in this change the pancreas seems to be so moulded that there is an actual increase in the extent of its inferior surface, and a decrease in the extent of its gastric surface. The projecting anterior border of the pancreas presents between the jejunum below and stomach above. Fig. 1, Plate LIV., shows the different positions of the parts in the stomach-bed in the low and high positions of the stomach from two consecutive cases.

Permanent hardened preparations from cases 1 and 2 of this series illustrate very well these different points in connection with the stomach-bed.

If the stomach should project, as it usually does, below the anterior border of the pancreas, it is supported behind by the layers of the transverse meso-colon as they pass forwards.

The transverse meso-colon completes the stomach-bed behind and supports it below—the meso-colon being supported in its turn by the convolutions of the small intestine, as well as, perhaps, being held up, or even dragged up, by a distended transverse colon,—which, if convoluted, the small intestines being at the same time distended, may find room for itself by passing upwards over the front of the stomach. The stomach-bed at the left and below is completed by the splenic flexure of the colon, where the colon passes backwards across the basal surface of the spleen.

Finally, traced internally, the inner wall of the stomach-bed is formed by the diaphragm fibres passing downwards to the left crus across the sides of the vertebræ, and supporting in part the left supra-renal body. Internal to the supra-renal, as a rule, a portion of the left semilunar ganglion presents.

The pancreas traced internally passes into a convexity over the front of the vertebral column and aorta, and often presents a well-marked ridge as figured by His. This ridge on the pancreas was not usually found to be median in position. It was, when present, mostly situated to the left of the middle line, having a direction downwards and inwards, corresponding to a groove often present on this part of the stomach.

The pancreas in the average of the cases projected 5 cm. above the lesser curvature of the stomach in the middle line, and the stomach passed to the right as far as the pylorus, lying on the pancreas, the gland being moulded for its reception.

The anterior border of the pancreas, traced inwards from over the left kidney, becomes in the middle line, where it overhangs the emergence of the mesenteric vessels, the *lower* border of the body of the pancreas. It represents at this place the conjoined anterior and posterior borders, the inferior surface having ceased. However, even in the middle line, this border will always be spoken of as the *anterior* border.

AVERAGES.

After the foregoing detailed description of the stomach-bed, the following averages suffice for this section.

The upper border of the pancreas in the middle line reached 2·4 cm. above the level of E.F., ·5 cm. above the lesser curvature. The greater curvature in the middle line overhung by 1 cm. the commencing anterior border of the pancreas, which here was 1·5 cm. below E.F. The vertical depth of the pancreas in the middle line, from the upper to the anterior borders, was therefore 3·9 cm. In the left lateral line the greater curvature projected 1·55 cm. lower than the anterior border of the pancreas, which here was situated ·3 cm. above E.F.; the extent to which the stomach projects below the anterior border of the pancreas indicating the extent to which it is supported behind by the transverse meso-colon.

The pancreas extended 9·1 cm. to the left of the middle line, and on the same transverse plane as its extreme left point the extent of the greater curvature to the left was 9·5 cm.

The line E.F. passes across the upper part of the head of the pancreas, and represents at the left costal arch its anterior border.

The upper pole of the left kidney, at a distance of 6·16 cm. from the middle line—practically the lateral line—was situated 4·5 cm. above E.F. The upper border of the pancreas in the same vertical plane was 3·4 cm. above E.F., thus leaving an average possible gastric surface of the left kidney of practically 1 cm.

In the left lateral line the average depth, in the vertical plane of the gastric surface of the pancreas, was 3·1 cm., and the depth, antero-posteriorly, of its inferior surface was 2 cm.

Behind the pancreas the inner convexity of the upper segment of the left kidney was situated 3·8 cm. from the middle line. The extreme outer point of the kidney, at an average level of ·6 cm. below E.F., was 9·6 cm. from the middle line. The extreme outer point of the left kidney was therefore situated a little lower and a little more to the left than the extreme left of the pancreas.

The lower border of the left supra-renal capsule was situated 5 above E.F.; its upper point about 2 cm. above the upper border of the pancreas and 5.5 cm. above E.F., and its innermost point, usually also its lowest point, 2.4 cm. from the middle line.

The lowest point of the anterior border of the spleen was situated 1.4 cm. below E.F., 11.5 cm. from the middle line, or .75 cm. more to the left than the extreme left point of the greater curvature of the stomach.

In those cases in which there was no marked angle at the lower border of the spleen, but in which the anterior border sloped gradually into the basal surface, the 'lowest point' had to be selected arbitrarily. The lowest point of the whole spleen, usually at the back of the basal surface, was situated 2.5 cm. below E.F. The highest point of the spleen was 8.7 cm. above E.F., 1.1 cm. below the infra-sternal notch, and 5.8 from the middle line. The innermost point of the spleen was situated a little above the level of the left kidney, 3.6 cm. from the middle line.

III. VARIATION IN THE SHAPE OF THE STOMACH.

The outline of the stomach, seen from the front, as obtained in this work, does not necessarily indicate what would be its shape if it were removed from the body and filled. The outlines (see Plates XLIII. and XLIV., Part I.) are no doubt determined very much by the pressure of surrounding viscera. But allowing for this, the cases do, perhaps, furnish some indications of certain natural varieties in shape.

First variety.—A type of stomach, usually not of large size, and characterised by a long cylindrical portion passing to the pylorus, is, perhaps, the commonest. Examples of this shape are seen in Nos. 1, 3, 6, 8, 18, 20, 25, 30, 31, 35, and 37, and to a less extent in Nos. 17, 24, 26, 27, 33, and 40—that is, in 42.5 per cent. of the total cases. Sometimes it was plain that the shape was produced, to a great extent, by the pressure of the transverse colon. For instance, the stomach in case 21 might seem deservedly to be included in this group, but reference to the complete plate of the case shows that the appearance is produced by the pressure of the adjoining colon. (The

figures of the colon will be published in a subsequent number of the *Journal*.)

In connection with this type of stomach, it will be seen that they represent amongst them all those in which the stomach was highly placed, except No. 12 in which the stomach was of a somewhat similar shape. The high position of these stomachs is most likely accounted for by the fact, that they contain amongst them all those cases in which a distended transverse colon passed highly upwards in front of the stomach,—viz., cases 1, 6, 8, 25, 31, 35, 37 and 40, with case 12; and in others of the group the colon was distended, though not in front of the stomach, as in cases 20 and 18; in which last case also the jejunum was distended. It is clear that a distended transverse colon was associated very commonly with this shape of the stomach, and, presumably, was to some extent responsible for it. I think, however, that it is open to question, seeing, for instance, that the stomach from case 1, which was removed from the body and filled with agar jelly, still retained its shape, whether this type of stomach, being mostly small, does not, if the colon becomes distended, as it were, invite the bowel to seek its additional room in the upper part of the abdominal cavity; so that a distended colon high in the abdomen may not alone be the cause, but, perhaps, to some extent, the consequence of a stomach this shape.

In case 27 the stomach and liver were pushed down by a large intra-thoracic growth.

Eight of the subjects with this type of stomach were emaciated, and had suffered from long-standing disease.

Second variety.—The stomachs Nos. 5, 12, 15, 19, 23, and 36, and to a less extent Nos. 4, 11, and 24, show evidence of a *constriction* somewhere in the cardiac portion, that would no doubt have been permanent—cases 23, 36, 15, and 5 being the best examples. The constriction, when present, tends to be about half-way along the left border of the greater curvature.

Third variety.—A third type of stomach, almost evenly cylindrical and usually capacious, is represented by Nos. 2, 7, 10, 22, 38, and 39, also by No. 14—the kink in which was produced by the pin. Nos. 21, 24, and 34 probably represent intermediate states between this type and the elongated con-

stricted stomach of Nos. 15 and 36. Several of these were, apparently, chronically distended.

These cases did not present much in common. Four were emaciated, and had suffered, three from phthisis, and the other from tubercular salpingitis. The other cases presented various diseases. Three of the subjects are described as fat.

Fourth variety.—Some of the other stomachs which were distended presented a more quadrilateral shape, of which No. 16, which was pushed over to the left by a large liver, is the best example. Nos. 9, 28, 29, and 32 are of a similar shape; but the straight lower border in cases 28 and 29 was distinctly produced by a distended straight transverse colon.

Cases 13, 31, and others, show also quadrilateral features.

IV. VARIATIONS IN THE POSITION OF THE STOMACH.

THE CARDIAC ORIFICE.—The outlines on Plates XLIII. and XLIV. (Part I.) show these variations much better than a mere statement of numbers can. The general position of the centre of the cardiac orifice, 2.1 cm. below the infra-sternal notch and 1 cm. from the middle line, agrees very well with that given in most text-books. There was, however, in this part of the stomach, an excursion of its central point about the infra-sternal notch of 7 cm.; from 6 cm. below in case 7, to 1 cm. above in cases 4 and 34.

High Positions.—In three instances, Nos. 4, 12, and 34, the centre of the cardiac orifice was above the infra-sternal notch, the maximum being 1 cm. In the first of these, a patient with phthisis, the stomach was large and full. There is no record of distension of the rest of the intestine. The transverse colon was low and tortuous. In the second instance, a case of pneumonia, the jejunum and cæcum were very distended, the transverse colon was full, and the splenic flexure of the colon reached high up to the left of the stomach into the vault of the diaphragm. In the third case, with pulmonary phthisis and some tubercular peritonitis, the small intestines were very distended, but the colon was in its normal position. In this case (see Plate LII.) the liver was very large, and extended to the left across the stomach, overlapping the spleen.

Low Positions.—There were six cases in which the centre of the cardiac orifice was 4 cm. or more (up to 6 cm.) below the infra-sternal notch (Nos. 7, 15, 18, 27, 30, and 35). The first was a case of right pneumothorax, with the liver and stomach pushed down. The second case presented a large intra-thoracic tumour, with a similar displacement of the stomach and liver. In the third, although the upper border of the stomach was lower than the average, the lower border was higher than usual, and was supported by distended intestines above a low transverse colon. There is nothing recorded from the thorax to account for the low cardiac opening; the costal arch was narrow. In the fourth case there was a large secondary sarcomatous growth in the thorax, especially in the left side; the transverse colon was distended and low. In the fifth case there was no special factor recorded; the small intestines were distended, but the transverse colon was low down, running across the pelvic cavity. In the last case, one of advanced phthisis, the lower border of the stomach, again, was higher than usual, but the cause of displacement of the upper border downwards was quite obvious, for a huge transverse colon had passed up in front of the stomach, pushing the liver over to the right, and insinuating itself between the stomach below and diaphragm above. It is unfortunate that a record of the condition of the heart was not made in all these cases, especially in case 18.

CONCLUSIONS.—The chest conditions, as would be anticipated, seem the most important in producing *downward displacements of the cardiac part* of the stomach, even against considerable intestinal distension below.

Upward displacement is usually associated with distension of the intestines, and often with a transverse colon passing upwards in front of the stomach. But, on the other hand, it is clear that distension of the intestines, even when there is absence of any obvious thoracic opposition, is not always associated with a raised cardiac orifice, as cases 18 and 35 show. The distension of the transverse colon, in fact, in the last case, as already explained, was the actual cause of the downward displacement of the cardiac orifice.

The relative levels of the cardiac and pyloric orifices are

shown on curve A, Plate LIII. Although there is a general correspondence in the levels, cases 11, 14, and 40, in addition to those already quoted, show that the stomach may be full and have a normally situated, or even raised, pylorus, and that yet there may be a low cardiac opening; the mutual abdominal and thoracic pressures causing the transverse diameter of the stomach to be much the longer.

THE PYLORUS.—If the outlines on Plates XLIII. and XLIV. (Part I.) or curve B on Plate LIII. be consulted, it will be seen that in 24 cases, or 60 per cent. of the whole series, the line *E.F.* passed through some part or other of the pylorus, or was within half a centimetre of one of its margins; and that in 29 cases, or 72·5 per cent., it passed either through the pylorus, or within a centimetre and a half of its margins.

1. *Vertical Displacements.*—There were 29 cases in which the upper border of the pylorus was in the plane of, or above the level of *E.F.* In 24 of them the distance did not exceed 3 cm., and in the remaining 5 cases (Nos. 25, 40, 5, 37, and 31) the greatest height above *E.F.* was 6·5 cm., in case 31.

There were 11 cases in which the upper border of the pylorus was *below* the level of *E.F.*, 5 of them being at or less than 2 cm. below; the remaining 6 cases (Nos. 32, 34, 7, 36, 15, and 2) being more than 2 cm., up to 6·5 cm. below, in case 2.

(a.) *High Position.*—The colon was distended in each of the five cases in which the pylorus was highly situated (those in which the upper border was more than 3 cm. above *E.F.*), and in four of them (Nos. 25, 40, 37, and 31) passed upwards to a variable height in front of the stomach. In the other case, No. 5, a distended jejunum pressed up the stomach. In these cases the liver was pressed upwards and to the right, and was noted to be small in cases 5, 31, and 37. (See the outlines on Plate LII., and the curves B, C, and D of Plate LIII.)

(b.) *Low Position.*—Five of the 6 cases in which the pylorus was situated low down (the upper border more than 2 cm. below *E.F.*) were associated with a large or displaced liver—cases 34 and 36 with large lardaceous livers, case 15 with an immense liver pushed down by a large growth filling the right side of the chest, case 7 with a liver displaced by a right pneumothorax,

and case 2 with a large and somewhat low nutmeg liver. In all of these 5 cases also the stomach was distended, and was vertically elongated. In case 24, although not coming under this arbitrarily-defined group, the pylorus was displaced downwards and to the left by a large lardaceous liver, the stomach being of the elongated variety. The remaining case in which the pylorus was more than 2 cm. below E.F. (3 cm.) was No. 32. In this case the liver was small and pushed over to the right, the pylorus following it on its under surface, and a distended stomach lay horizontally across the abdomen, nearly bisected by E.F. In this case, as well as in all the others presenting a low pylorus, there was a low, prolapsed transverse colon (case 34 being the least marked). In Nos. 7, 32, and 36 there was a considerable interval between the upper border of the prolapsed transverse colon and the greater curvature of the stomach, in which the stomach was supported behind the meso-colon by the small intestines.

Downward Displacement of the Stomach.—Now, a stomach may be full, in fact distended, without coming appreciably much lower in the abdominal cavity, as outlines 9, 10, 16, 23, 28, and 29 on Plates XLIII. and XLIV. clearly show. But it is the stomach elongated vertically (however that elongation may have been produced) which is found low in the abdominal cavity, and whose position is usually associated with a liver enlarged or displaced downwards and a prolapsed or low transverse colon.

Although not quite *apropos* of the position of the pylorus, it will be convenient to take here the other cases in which the stomach reached low down in the abdominal cavity. In case 38, in which all the parts were loaded with fat, and the parts of the gastrointestinal canal were very capacious, with some most noteworthy features, the stomach was very flabby, and of immense size, and came 10 cm. below E.F. in the middle line. The liver was not enlarged, and occupied its normal level, and the pylorus was at its usual height. In this case the transverse colon ran along the lower border of the stomach to the left lateral line, where it passed upwards beneath the stomach to the splenic flexure, which was situated 1 cm. above the level of E.F. In case 39, in which there was acute general peritonitis from the rupture

of a left tubal abscess, with a large quantity of fluid in the abdominal cavity, the stomach was 8 cm. below E.F. in the left lateral line; there was a large liver extending low down, at the right, and with a thin flap overlying the stomach below E.F. to the left of the middle line, and a distended transverse colon passing across below the greater curvature of the stomach. The upper border of the pylorus in this case was situated *in the plane of E.F.*, 7.5 cm. to the right of the middle line. In case 30, in which the greater curvature in the middle line was 4 cm. below E.F., there was a prolapsed transverse colon running across the pelvic cavity, and the liver was a little lower than usual, the upper border of the pylorus being 1.5 cm. below E.F., and 1.25 cm. to the right of the middle line. Finally, in case 22, there was a large liver pushed down and over to the left by very firm pneumonic consolidation of the right lung, and the stomach was lying vertically; the upper border of the pylorus was situated 3.75 cm. to the left of the middle line in the plane of E.F. The transverse colon was low and tortuous.

CONCLUSIONS.

1, i. In considering the foregoing cases, it appears that a *highly-placed stomach* is usually associated with a liver placed well up beneath the ribs and often small, and with a highly-placed transverse colon, which in most cases was also distended. But as regards the colon, it appears that it may come upwards *in front of* the stomach without appreciably elevating the stomach itself; merely pressing it backwards into the stomach-bed.

ii. As regards a *low position* of the stomach, referring generally to the greater curvature, it appears to be specially associated with the liver extending low down in the abdomen, and perhaps enlarged, and with a prolapsed colon. On the other hand, however, by an increase of the length of the peritoneal fold attaching the colon to the lower border of the stomach, the transverse colon may sink away from the greater curvature of the stomach, leaving the stomach supported, *at its usual level*, by the intestines behind a long transverse meso-colon.

As regards the alterations in level of the *pylorus*, in particular, it is clear that the liver is the chief determining factor;

that when the liver extends low down in the abdominal cavity, the pylorus is generally lowly placed, and *vice versa*; allowing for the fact that the part of the liver overhanging the stomach varies considerably in thickness, it appears, as case 38 shows very well, that *mere distension* of the stomach, apart from a low position of the liver, does not suffice to produce material downward displacement of the pylorus. This matter, however, will be more fully set forth in the course of the following section.

2. *Lateral Displacements of the Pylorus*.—Following the suggestion contained in the preceding paragraph, it is found that with regard to the position of the pylorus to the right or left of the middle line, a matter as important as, if not more important than the degree of the distension of the stomach at any particular time, is the position of the liver, and, more particularly, the shape of its under surface. By means of the strong right part of the lesser omentum, and the structures contained within it, connecting the pylorus and the first part of the duodenum to the under surface of the liver, the pylorus is firmly held up to the transverse fissure of the liver, and its position and obliquity by this means considerably determined.

Taking first a summary of the various positions of the pylorus:—In 34 cases it was on the middle line or to the right of it; and in 6 cases to the left.

Analysing the first group of 34 cases:—In 14 instances (in three of which some part of the pyloric border touched the middle line) the pylorus was up to or less than 2 cm. to the right of the middle line. In a further 14 cases it was more than 2 cm., up to or less than 4 cm., to the right of the middle line. Beyond this distance to the right there were 6 cases; 4 of them up to, or less than, 4·5 cm. from the middle line; and two cases, Nos. 35 and 4, were 5 cm. and 6 cm. respectively from the middle line. In both these the greater curvature of the stomach was at a higher level than usual.

Of the 6 cases in which the pylorus was situated to the *left* of the middle line, 4 were up to or less than 2 cm. away, the remaining two (Nos. 22 and 24) were 3·5 cm. from the middle line.

(These measurements in all cases relate to the upper border of the pylorus.)

The figures yield the result that in 45 per cent. of the cases the upper border of the pylorus was not more than 2 cm. from the middle line to one side or the other: that in 22·5 per cent. of the total cases the pylorus was in the middle line or to the left of it; and that in 15 per cent. only of the cases was it situated more than 4 cm. to the right of the middle line.

The direction of the pylorus in 24 cases, or in 60 per cent. of the whole series, was practically vertical; in 10 cases it was oblique, and in the remaining 6 cases it was practically transverse. (Cases 2, 21, 24, 32, 34, and 38.)

(a) *Displacement of the Pylorus to the left.*—As to the cause of these lateral displacements of the pylorus: In those in which the pylorus was situated on the middle line or to the left thereof, the liver was in all cases, except the first, very manifestly the cause of the displacement. In the first case (No. 3), in which the pylorus was 1 cm. to the left of the middle line, the patient had died of prolonged sepsis, the liver had a massive omental tuberosity fitting into the lesser curvature, but it did not extend to the left of the middle line in the plane of the upper border of the pylorus; the stomach was small, and, like all the other parts of the gastro-intestinal canal, empty. In all the other cases, in Nos. 13, 15, 16, 22, and 24, in which the pylorus was to the left of the middle line, and in Nos. 7, 19, and 39, in which it was on the middle line, the liver extended low down and far over to the left at a low level, being either enlarged itself through disease, or displaced downwards by thoracic pressure. An attempt is made on the curve on fig. 2, Plate LIV., by depicting the relation of the upper border of the pylorus and of the lower border of the liver in the same horizontal plane to the middle line, to represent the conditions. The curve shows that these cases were accompanied by a considerable extension of the liver over to the left of the middle line.

The curve, however, is to some extent misleading. For instance, in case 2, in which the lower border of the liver is represented far to the right of the pylorus, the Plates XLIII. and LII., on comparison, show that the liver presented a nearly straight lower border 5 cm. above the level of the upper border of the pylorus, and that, although the lower border of

the liver, in the same plane as the pylorus, was so far to the right thereof, yet, at only 1 cm. higher level, the lower border of the liver crossed the middle line. A similar condition existed in case 3, in which a portion of the extreme right of the liver came into the curve, whilst at a level of only .25 cm. above the pylorus, the lower border of the liver crossed the middle line; and in case 37, in which an enormously distended colon pushed up the liver and stomach; also, in case 32, in which the liver was pushed up higher than usual by a very large dilated stomach. Case No. 32 exhibits the condition Prof. Symington (10) figures as the state of the distended stomach; but, as will be pointed out, these cases do not seem to warrant one in describing it as the normal condition of the distended organ.

If we consider the instances on the curve, and on the Plates in which the lower border of the liver extended far over to the *left* of the middle line in the same plane as the upper border of the pylorus, but in which the pylorus was not displaced to the left, it will be seen that in 2 cases, Nos. 6 and 26, the liver was as high or higher than usual, and that the pylorus had been pushed over *to the right* beneath the liver; in the first case by a high distended colon, and in the second case by a full stomach. In case 27 the liver was displaced downwards by a growth in the thorax, chiefly on the left side, and the left part of the liver being tilted down depressed the lesser curvature some distance from the pylorus. In case 33 the liver was fatty, but did not descend much lower than usual, and pressed by its omental tuberosity, as in the last case, chiefly on the lesser curvature beyond the pylorus. The remaining instance, No. 38, is very instructive, for it shows how little even an enormously dilated stomach is able to drag the pylorus downwards whilst the liver maintains its normal level.

Summing up the displacements of the pylorus to the left, the cases show clearly that the liver is the chief determining agent, and it seems that we could from these cases go so far even as to say that, *when the liver is enlarged and spreads downwards across the abdomen at a low level*, we may expect the pylorus to be pushed to the middle line or to the left thereof.

Although a consideration of these cases does not lead us to the conclusion that a pylorus situated to the left of its normal

situation is particularly associated with an empty condition of the stomach, if we look at those cases in which the pylorus is situated more than 1 cm. to the right of its average position, we find that they are particularly associated with a well filled or distended condition of the stomach.

(b) *Displacements of the Pylorus to the right.*—Symington (10) pointed out how the left overhanging part of the liver is tilted upwards and to the right on its long left lateral ligament by the filling stomach. If this ligament be long and membranous—even if the part of the liver overhanging the stomach is somewhat massive—the distended stomach can the more readily tilt the liver upwards and to the right, and insinuate itself further to the right underneath the liver. The strong attachment, already spoken of, of the pylorus to the under surface of the liver, would not resist a considerable movement of the pylorus to the right, as it does to the left, because of the obliquity of the attaching part of the lesser omentum.

If the liver be looked at from the front, a fair guide to the degree of lateral movement it has undergone may be obtained by noticing the situation and direction of the attachment of the falciform ligament on its anterior surface. On the diagrams of the liver on Plate LII., and on the composite figures of each case, with the exception of a few of the early cases in which, unfortunately, the point was omitted, the attachment of the falciform ligament to the liver is indicated by interrupted lines.

Those cases in which the pylorus was displaced to the right are so uniform, that, with the various illustrations, and the points already mentioned, it will be sufficient to represent them here in tabular form; and in reading the table, it will render the matter clearer if Plates XLIIL, XLIV. and LII. be compared at the same time.

In the table only those cases are represented in which the pylorus extended 3·5 cm. or more to the right of the middle line.

CASE.	Distance to right of middle line of the upper border of the Pylorus.	REMARKS.
2	3.5 cm.	Stomach distended and low. Liver ¹ a little tilted, low, and somewhat enlarged. Colon, no special feature.
14	"	Stomach full. Liver tilted. Colon very distended, pressing up the stomach.
21	"	All points the same as No. 14.
26	"	Stomach full, thrown into folds. Liver not much tilted. Transverse colon normal.
27	"	Stomach moderately filled. Stomach and liver both pushed down by intra-thoracic growth. Liver not tilted. Colon very tortuous and distended.
11	4 cm.	Stomach full. Liver tilted.
28	"	Stomach distended. Liver tilted and much pushed over to the right. Colon distended.
29	"	Ditto in all respects.
5	4.5 cm.	Stomach full. Liver and stomach pushed up and to the right by distended colon and intestines.
10	"	Stomach very distended. Liver pushed almost entirely to the right of the middle line.
32	"	Stomach very distended. Liver much tilted. Transverse colon prolapsed.
28	"	Stomach very distended. Liver tilted.
35	5 cm.	Stomach partly filled, thrown into folds. Liver and stomach both pushed upwards and to the right by an enormously distended colon. Liver almost entirely to the right of the middle line.
4	6 cm.	Stomach distended. Liver large, not much tilted to the right. Colon low and tortuous.

MOVEMENTS OF STOMACH.

In this place it will be convenient to summarise the impressions received concerning the movements of the stomach.

Although there were so many cases in which the stomach was well filled and distended, there was only one example (case 32) of the condition figured by Symington (10) in which the pylorus, in the distended stomach, was situated behind a portion of the stomach that had extended across to the right in front of the pylorus.

¹ The tilting of the liver is of the left lobe to the right and upwards.

I cannot but think that if this were the usual condition in distension, more examples would have been met with. In cases 34 and 38, however, a portion of the greater curvature passed well to the right beyond the pylorus, though at a lower level.

In those cases in which the pylorus ran transversely, or nearly so (Nos. 21, 24, 32, 34, and 38), the condition was clearly due to its being firmly held in this position to the transverse fissure of the liver. We have seen that a pylorus well over to the right is specially associated with a full stomach; but those cases, as I have indicated at various times, and as the figures show, by no means include all those in which the stomach was full; and, moreover, except in one case, No. 3, the pylorus did not tend to be situated markedly to the left of its average situation when the stomach was empty. I do not think that these cases warrant us in concluding that during filling of the stomach the pylorus moves more than 2 cm. to the right, if at all. *Movements of the pylorus to the left* have already been considered.

Filling of the Stomach.—As regards what would seem to take place during the process of filling of the stomach:—Apparently the stomach-bed behind is first occupied; then the greater curvature in front, to the left of and below the liver, comes to the abdominal wall, at the same time tilting upwards and to the right the left lobe of the liver, and directing the lesser curvature somewhat to the right and backwards; then, if necessary, the stomach extends somewhat to the right, downwards and forwards, pressing down before it the projecting anterior border of the pancreas and the transverse mesocolon.

SUMMARIES.

After the previous detailed statement of the variations in the position of the stomach, particularly of its two orifices, a summary of the chief variations of the other 'points' will suffice.

The extreme left of the lesser curvature from the middle line.—The average was 3·8 cm. There were 13 cases in which the distance was 5 cm. or more, up to 7 cm. in case 13. There were

12 cases in which the distance was 2·5 cm. or less, down to ·5 cm. in case 35. The point nearest to the plane of E.F., at which the lesser curvature attained its extreme left, averaged 4·5 cm. above E.F. There were 16 cases in which it was 6 cm. or more, up to 9 cm. (in 2 cases) above. There was one case in which it was below E.F. (4 cm. in case 7); and 4 cases in which it corresponded with E.F.

The lesser curvature in the middle line as to E.F. averaged 1·9 cm. above. There were 19 cases in which it corresponded with E.F., or was up to or as much as 3 cm. above. There were 14 cases in which it was more than 3 cm. above E.F., up to 7 cm.; in 7 of them being 5 cm. or less above. In 3 cases it was up to 1·5 cm. below E.F., and in 4 cases was more than this distance below, down to 6·5 cm. in case 2.

The height of the summit of the stomach above E.F. averaged 9·6 cm. In 11 cases it was 11 cm. or more above, up to 14·5 cm. in case 10. In 10 cases it was 8 cm. or less above, down to 6·5 cm. in cases 2 and 7.

The summit of the stomach as to the infrasternal notch averaged 1·3 cm. below. In 24 cases it was either at the same level or below; in 19 of these being not more than 1·5 cm. below. There were only 3 cases in which it was more than 3·5 cm. below. In the lowest instance, case 37, it was 4·5 cm. below.

There were 16 cases in which the summit of the stomach was above the level of the infrasternal notch; in 9 of them not being more than 1·5 cm. above. The highest was 4·5 cm. above in case 10.

The point along the plane of the summit of the stomach which was nearest the middle line averaged 5·1 cm. away. In 36 cases the variation was not more than 1 cm. either way from the average. One case, No. 24, was 3 cm. Three cases were beyond 6 cm., the extreme being 8·5 cm. in case 1. (In the light of later work I cannot but regard some of the measurements recorded in case 1 as of doubtful accuracy.)

The extreme left of the greater curvature from the middle line averaged 10·7 cm. There were 20 cases more than the average, and 20 cases less. Of these, 16 cases, each way, did not approach the middle line nearer than 9 cm., or extend more than 12 cm. away from it.

The distance, therefore, in 80 per cent. of the cases was between 9 and 12 cm., inclusive, from the middle line. Cases 9 and 16 presented the extreme distance to the left, 13·5 cm.; and case 2 the near limit of 8 cm.

The distance of the point, in a vertical plane through the extreme left of the greater curvature, which was nearest to E.F. averaged 3·5 cm. above that line. In 21 cases it ranged from 2 cm. above to 4 cm. above, inclusive; in 5 cases from 4 cm. to 6 cm. above, inclusive; 4 cases were at 7 cm. above, and 2 beyond this; the extreme being 10 cm. in case 12. In the remaining 8 cases, 7 were on the level of E.F., and 1, case 24, 4 cm. below it.

The greater curvature in the left lateral line as to E.F. averaged 1·2 cm. below. In 20 cases the distance above or below E.F. did not exceed 2 cm. either way. More than 2 cm., up to and including 4 cm., there were 5 additional cases each way. There were 2 cases more than 4 cm. above E.F., the extreme being 5·5 cm. in case 40.

There were 8 cases more than 4 cm. below E.F., and 4 of them were more than 8 cm. up to 11·5 cm. below, in case 35. *If these four lowest cases be excluded, the level of the greater curvature in the left lateral line would be E.F. exactly.*

The greater curvature in the middle line as to E.F. averaged 2·5 cm. below. From the level of E.F., up to and including 4 cm. below, there were 25 cases—62·5 per cent. There were 4 cases up to or as much as 2 cm. above E.F.; and 3 cases higher than this, the extreme being 4 cm. above in case 31.

The remaining 8 cases were from 6 cm. below E.F. to 13 cm. below in case 2. If these 8 cases of low stomachs be excluded, the level of the greater curvature in the middle line in the remaining 80 per cent. of the cases would average 1·2 cm. below E.F., instead of 2·5 cm.

DESCRIPTION OF PLATES.

PLATE LII.

The lines from the whole series of cases shown on a scale representing centimetres in relation to the costal arch, the middle line and E.F. (a line drawn transversely across the body through a point midway between the upper border of the pubes and the suprasternal notch).

PLATE LIII.

Curves illustrating various points in connection with the relation of the stomach to the liver and the transverse colon, and of the positions of the orifices of the stomach.

PLATE LIV.

Fig. 1. Showing the position of the parts behind the stomach when it is lowly placed—case 36—and when it is highly placed—case 37.

Fig. 2. Curves showing the relations of the upper border of the pylorus and the lower border of the liver in the same horizontal plane to the middle line.

PROFESSOR ADDISON ON ABDOMINAL VISCERA IN MAN.

APPENDIX.—TABLE III.—THE STOMACH (continued), AND THE DUODENUM.

Number of Case,	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	AVERAGE.
<i>The Stomach, the Pancreas, Left Kidney, and Supra-Renal.</i>																																									
Distance of the highest point of the left kidney above the upper border of the pancreas,	2	2·5	1·5	1·5	3·25	1	2	1	2·5	2	...	2·5	2	...	3	=	2	4·5	·5	...	1·5	1·5	...	2	...	4·25	2	3	1	5	...	1	=	1	1 above.
or Distance of the highest point of the left kidney below the upper border of the pancreas,	2	1	...	1	2	1·5	·5	1·5	·5	...	=	1·5	1·5	...	2	·5	...	=	...	3·4 above.
The upper border of the pancreas in the same vertical plane above or below E.F.,	1·5a	2b	5·5a	6a	5a	6·5a	1·25b	5a	5a	6a	3a	5a	2a	1a	1·5a	4·5a	4·5a	2·5a	4·5a	4·5a	4·5a	4a	6a	3·25a	4·75a	5a	·5a	·5a	2a	3a	5·5a	·25a	2·5a	4·5a	4a	...	7·5a	4·75a	4·5a	1·5a	4·5a
The greater curvature of the stomach	1a	9b	·5a	·5a	1·5a	3a	11b	2a	=	1·5b	2·5a	2·5b	1a	9·5b	2·5b	1·5a	·5a	2·5b	2a	6b	1b	7b	4a	4a	2a	2·5b	=	2b	4a	3·5b	=	·5b	3a	11·5b	5a	6·25b	8b	5a	1·1 below.		
The lower border of the left supra-renal	1·5b	*	1a	3·75a	1·5a	3a	1·5b	1a	=	2a	1b	1·5a	·5b	1a	·5b	=	·5a	1a	1a	=	2·5a	·75a	3a	1·75a	2a	·5a	3b	1·5b	3b	·5a	2·5a	1b	·5a	3a	1·5a	1a	1a	=	2·5b	1a	·5 above.
Extreme depth of the inferior surface of the pancreas over the left kidney,	2·5	2·8	1·5	2	1	2	nil.	2	3·5	3	3	1·5	2	2	1	2	1	1·5	2·5	3	2	2	2	2·5	3	2	2·5	1·5	1·5	1·5	2	2	1·5	2·5	3	2·5	1·5	3	1·5	2	
<i>The Spleen and Left Kidney.</i>																																									
Distance to the left of the middle line of the lowest point of the anterior border of the spleen,	13·5	9·5	11·5	12	12	10·75	11	10	12·5	12	13	12·5	11	12	12	12·5	13	10	13	10·5	12	11·5	13	10	11·5	10	11	12·5	11	10	10·75	12	13	11·5	12·5	10	10	12	10·5	10·5	11·5 (11·48) [°]
Distance of the lowest point of the anterior border of the spleen above or below E.F.,	2·5b	7·5b	2·5a	3a	1a	1b	3b	3·75a	2·5b	2a	5b	2a	=	3b	2·25b	3b	6·5b	2a	·5b	4b	2a	1·5a	3b	=	4b	=	6·5b	3·5b	2·5b	·5b	=	2b	·5b	3·5b	2b	4·5b	4·5a	6b	3b	1·5a	1·4 below.
Distance of the highest point of the left kidney above or below E.F.,	3·5a	·5a	7a	7·5a	3·5a	5·5a	2a	4·5a	3a	5a	2·5a	6a	4a	2a	4a	6·5a	3a	5a	6·5a	4a	7·75a	4·25a	8a	8a	5·5a	3·5a	2a	2a	·5a	5a	3·5a	4·5a	4·5a	7·5a	5a	6a	4·5a	5·5a	1·5a	5·5a	4·5 above.
" " " spleen above E.F.,	9·75	4·5	8·75	12·5	11	9	5·5	10	8	12·5	6·5	11·5	8	7	8	9	8	10	10	8	11	7·5	9·5	9	8·75	10	3·5	6·5	7·5	7	12·5	7	8·5	10	8	7	9	9·5	9·5	10	8·7
" " " above or below the infra-sternal notch,	·75a	3·25b	1·75b	1a	=	·5b	4·75b	1b	2·25b	2·5a	1·75b	2·25a	·75a	3·5b	2·5b	1b	1·25b	2b	1a	1·5b	=	2·5b	=	·5b	1·25b	·5a	5·5b	2·5b	1b	4b	1·5a	2b	1·5b	2a	3·5b	1·25b	·5b	·5b	·75b	1b	1·1 below.
" " " from the middle line,	7	5	6	5·5	6	5·5	5	5	5·5	7	7	7	6	6	6	6	5	6	6	5	6	6	6	5	6·5	6·5	6	6	5	5·5	5·5	5·5	7	5	6	4·5	5·5	6·5	4·5	6	5·8
" " of the innermost point of the	4·5	2·25	3·25	3	3·5	3	3·75	3·25	4	4·5	4	5	3·25	4·75	4·5	4·25	3	3	3·5	3	4	3·5	3·5	3	4·5	3	4·5	3·75	3	4	3·5	3·5	4·5	3	3·5	3·5	4	3·5	3	3·6	
<i>The Duodenum.</i>																																									
THE DUODENUM AND ITS RELATIONS.																																									
Distance of the highest point of the first part of the duodenum above or below E.F.,	·75a	4·5b	1a	3·5a	6a	3·25a	2·5b	3a	1·5a	4a	1·5a	3a	=	2·5a	4b	=	2a	3a	2a	=	3a	·75a	3·75a	1a	4·5a	2·75a	1·5a	2·75a	3a	1b	6·5a	1a	=	3·25a	2a	2b	5·75a	2·75a	1·75a	4·5a	1·8 above.
Distance of the highest point of the first part of the duodenum to the right of the middle line,	3	5	1	6·5	6	5	3	2·5	4·5	7	5	3	=	4·5	1	5	4	4	2	5·5	6	1	4·5	1	3	5	5	5	5	3	4	6	5	4·5	6	5	3	6	4	3	4
Distance of the lower border of the liver, in the vertical plane through this point above or below E.F.,	...	5·5b	2a	·5a	6a	1·5b	8b	1a	=	=	3b	·5b	3b	·5b	8·5b	5·5b	4b	·5a	2·5b	3·5b	2b	4·5b	2a	2·5b	1·25a	·5a	5·75b	2a	4b	3·5b	3·5a	2b	3b	4·25b	2b	7·75b	6·25a	1·25b	4b	4a	1·6 below.
Distance of the tip of the gall-bladder above or below E.F.,	...	6·5b	6b	·5b	6a	5b	11·5b	2b	1·5b	2·5b	4·5b	2b	6·5b	3b	13b	10b	3·5b	3b	4b	3·25b	3·5b	4b	2b	6b	1a	1·75b	3b	=	5·5b	6b	1·5a	8b	2b	1·5b	4·5b	9·5b	4·5a	4b	6b	3b	3·73 "
" " " from the middle line,	...	7·5	6	7	7·5	5	5	6	10	8	8	8	8·5	6	1	8	8	7	3·5	7·5	8	=	8	1·5	7	6	4	8	9	4	6·5	8·5	8	6	9	5	7	10	4·5	6·5	6·5
" " of the extreme right of the duodenum from the middle line,	7·5	7·5	5·75	7·5	8·25	6	6·25	5·5	7·5	10·5	10·5	8·5	6	8	2·5	7·5	7	7·5	5·5	7	6	7	3·5	7·25	6·5	6·5	8	8·5	6	6·5	8	8	8	8	8	7	7	7	7	7	7
2 " " that the duodenum is away from or beneath the right costal arch,	-2(9")	-2(9")	-1·5(9")	+3·5(8")	+4(8")	+2(8")	-3(9")	+1(8")	-1·5(8")	+4·5(8")	+1(9")	+5(8")	-3(9")	+·5(8")	-5(9")	+1(9")	=(9")	+3·5(9")	+·5(8")	+·5(8")	+3(8")	-4·5(9")	+1·5(8")	-·5(9")	+·5(8")	+2(8")	-1(9")	+1·5(8")	+·5(8")	-1(9")	+·5(8")	+·5(8")	-2(8")	+1(8")	+·5(9")	-1(9")	+2(8")	+1(8")	+1·5(9")	-·75(8")	See Text (just under cover of eighth costal cartilage).
3 " " of the greatest overlapping by the duodenum of the right kidney,	2	3	1	3	4·25	2·5	2·5	2	2·25	4	3·5	3·5	1	2	-1·5	3	2·5	4	1·5	2·5	3·5	1·75	2·5	=	1·5	2·5	3	2·5	2·25	1	2	3	2·5	4	3	3	2	2	2·5	2·5	2·38
" " of the right point of the duodenum above or below E.F.,	3b	8b	4b	2a	3a	=	7b	1b	3b	=	4b	2b	6b	4b	7b	3b	3b	=	4b	2·5b	=	5b	=	2b	2·5b	=	1b	3b	3b	5b	=	2b	3b	4b	2·5b	3·5b	=	2·5b	5b	2·5 below.	
4 " " of the lowest point of the duodenum below E.F.,	9·5	12·5	9	4·75	3	6·5	11·5	6·5	8·75	9·5	10·5	10	11·5	8·5	11·25	10·75	8·5	7·5	9·5	11·5	6	9	8·5	6·5	8	6·75	8	8·5	9·5	9·75	7	10	9	9	7·75	9·5	9·25	11	8	8·7	
" " " above or below the iliac crest,	·5b	1·5b	·25a	2·75a	6·5a	3a	2·75b	2·5a	1·75a	·5a	·75a	·75a	2·25b	1·5a	2·25b	·75b	1·5a	2·5a	=	2·5b	2·5a	=	1a	1·5a	=	2·25a	=	1·5a	·5a	·25b	2·5a	·5b	2a	=	2a	·5a	1·5a	1·25a	1b	·5b	7·9 above.
" " " in the middle line below E.F.,	9	11	8·5	3	3	6·5	6·5	6	8·5	7·5	9	8·5	11·5	8	11	10·75	7	9·5	11·5	4·5	8·5	6·5	7·5	6·75	8	6	9·5	7	8	9	7·5	7·5	7·5	9	8·5	11	3·5	3·5	7·9 below.		
" " " as to the umbilicus,	=	1b	=	6a	6·5a	3a	4·25a	3a	4a	2·75a	3·5a	2·25b	2a	·5b	·25b	3·5a	2a	1·5a	1b	5a	·5b	3a	3·5a	2·5a	3·25a	2a	4a	2·5a	4a	4·5a	2a	4·5a	2·5a	3·5a	1a	2·25a	5a	4b	4a	2·3 above.	
5 Distance of the highest point of the duodeno-jejunal flexure above or below E.F.,	2·5b	6b	2b	2a	4a	4a	4b	2a	2a	2a	=	·5a	=	4b	·5b	=	1a	2b	2a	=	1·5a	2·25b	2a	=	2a	1a	1·5b	1b	1·5b	1a	3·5a	2b	1b	·5a	·5a	2·5b	2a	=	3b	1a	Corresponds.
" " " from the middle line,	2·5	3	3	2	2(R)	4	1	5	5	3	4	4	5	3	7	4·5	3·5	4	3	4	3	4·5	2·5	3	3	2	2	2	4	2·5	=	3	2	2	2	3	1·5	2	2·5 (R)	2·8 left.	

* In Case 2 on the left side the supra-renal capsule was not measured.
1 In the cases where the upper border of the spleen is horizontal, by the 'highest point' is meant the point on that border nearest to the middle line.
2 When the duodenum extends under the costal arch, the figure is preceded by the sign +; where it does not pass beneath the cover of the costal arch, the sign - accompanies the figure indicating the shortest distance from the costal margin. The figure in brackets indicates the costal cartilage to which the measurement is made—thus (9") represents the 9th costal cartilage.
3 The point nearest to E.F. where the duodenum reaches its right extreme is spoken of as the 'right point' of the duodenum.
4 By the iliac crest is meant the highest point of the crest.
5 When the duodeno-jejunal flexure takes place to the right of the middle line, the letter R, thus (R), accompanies the figures. By the duodeno-jejunal flexure is meant that part where the small intestine becomes free. In cases 8, 21, 22, and 38, in which the duodenum, at the place of the usual flexure, bent downwards again for some distance to the right before becoming free as the jejunum, the figures are applied to the highest point of the bend.
[°] See Note on Table II.

PROFESSOR ADDISON ON ABDOMINAL VISCERA IN MAN.

APPENDIX.—TABLE II.—THE STOMACH AND ITS RELATIONS.

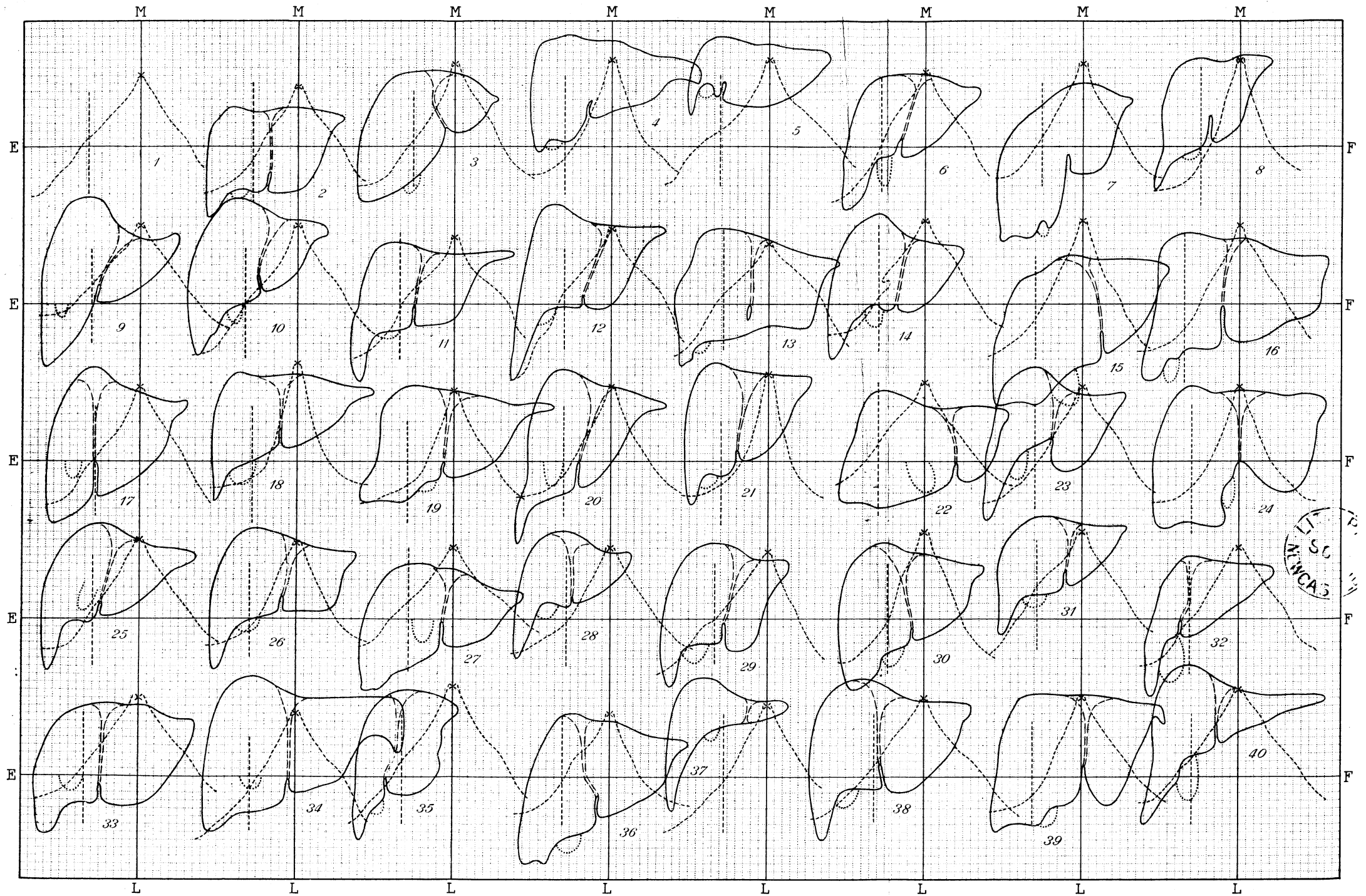
	Number of Case,																																								Average (see Note).		
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.			
¹ Distance of the cardiac orifice above or below the infra-sternal notch,	2b	2·75b	2b	1a	=	1b	6b	2b	3b	=	2·75b	·25a	1·25b	3·5b	4·5b	2·5b	1·75b	4b	·5b	3b	2·5b	2·5b	1·5b	2·5b	2b	1·5b	5·5b	1·5b	1·5b	4b	=	3b	1·5b	1a	4·5b	1·75b	·5b	1b	3·25	2·5b	2·1 below.		
" " " above E.F.,	7	5	8·5	12·5	11	8·5	4·5	9	7·25	10	5·5	9·5	6	7	6	7·5	7·5	8	8·5	6·5	8·5	7·5	8	7	8	8	8·5	7·5	7	11	6	8·5	9	7	9	9	7	8·5	8·5	7·7 above.			
" " " from the middle line,	3·5	1	1·5	·5	1·5	1	1	1·5	1	1	·5R	1	1·5	1	1	1	1	1	1·5	·75	1	1·5	1	·75	1	·5	1	1	·5	1	1	1	·75	1	·5	1	1·5	1	1	1	1	1	1
<i>The Lesser Curvature.</i>																																											
² Distance of the extreme left from the middle line ('left point'),	5	2·5	5	3	5·5	4·5	4	6	4·5	2·5	1·5	3	7	2	6·5	4	5	5	5·5	2·5	1·5	5·5	3·5	6	6	1·5	3·5	2·5	1·5	4	4	3·5	5	2·5	·5	5·5	3	1	4	4	3·8		
" of the above point above or below E.F.,	3a	=	5a	7·5a	9a	7·5a]	4b	6a	6a	5·5a	3·5a	7a	2a	4 5a	=	2a	4a	6a	6·5a	3a	5a	2a	5a	=	7a	6a	1·5a	6a	6a	5a	9a	5a	5·5a	5a	6a	=	8a	3a	3a	7a	4·5 above (4·47)		
³ " " in the middle line above or below E.F.,	1a	5·5b	1a	5·5a	7a	5a	4b	3a	3·5a	4·5a	2a	2·5a	=	3a	4·5b	1b	2·5a	3a	1·5a	2a	2a	·5a	3a	1a	4a	3·5a	·5b	5a	5·5a	1·5b	6·5a	3·5a	=	5·5a	6b	7a	=	·5b	6a	1·9 above.			
" of the upper border of the pylorus above or below E.F.,	·5a	6·5b	1a	2·5a	5a	3a	4b	3a	1a	2·5a	1·5a	2·5a	=	·75a	6b	1·5b	2a	3a	1·5a	1b	1a	=	3a	2b	4a	2·5a	·5a	2·75a	2·5a	1·5b	6·5a	3b	·5b	3b	2a	5b	5·5a	=	4·5a	·76	"		
³ " " " " from the middle line,	1	3·5	1L	6	4·5	3	=	1	2	4·5	4	1	1·5L	3·5	2L	2L	2·5	1	=	2·5	3·5	3·5L	2	3·5L	1	3·5	3·5	4	4	1·5	2	4·5	3	8	5	1·5	3	4·5	·5	1·5	2	(1·95)	
<i>The Greater Curvature.</i>																																											
Distance of the summit of the stomach above or below E.F.,	9·5	6·5	10	13·5	13·5	10·5	6·5	11	10	14·5	7	12·5	8	8	7	9	9·5	10·75	11·5	8·5	10·5	10	11	8·5	10	10·5	4·5	10	8	8·5	13	8	9	10	9	7	11	12	8	11	9·6 above (9·66)		
" " " " the infra-sternal notch,	·5a	1·25b	·5b	2a	2·5a	1a	4b	=	·25b	4·5a	1·25b	3·25a	·76a	2·5b	3·5b	1b	·25a	1·25b	2·5a	1b	·5b	=	1·5a	1b	=	1a	4·5b	1a	·5b	2a	1b	1b	2a	2·5b	1·25b	1·5a	2a	2·25b	=	=	·13 below.		
" " " " from the middle line,	8·5	4	5	4	5	5·5	4·5	6	5	5	4·5	6	5·5	5	5	6	5	6	6·5	5·5	5	5	5	3	4	5	4	5	4	5	7	6	5	4	4	5	6	5	6	5·1			
² " of the greater curvature to the left of the middle line ('left point'),	11·5	8	10·5	11	9·5	10·5	11	8·5	13·5	11	9·5	9·5	11·5	12	13	13·5	12	10·5	10·5	8·5	10	11	12	10	11	10·5	8·5	13	11	9·5	10·5	11	12	10·5	9·5	10	10·5	12	11	11·5	10·7		
² " " of the above point above or below E.F.,	3a	=	6a	4a	7a	4a	=	4a	3a	8a	3a	10a	2a	3a	=	4a	4a	3a	3·5a	6a	=	7a	4b	6a	5a	2a	2·5a	2a	4a	7a	=	4a	2·5a	5a	4a	=	=	4a	3·5 above.				
" in the left lateral line above or below E.F.,	1a	8·5b	=	·5a	1·5a	3a	11b	1·5a	=	·5b	·5b	1·5a	3b	1a	10b	2·5b	·5b	=	2·5b	2a	2·5a	6b	1b	7b	4a	2a	3b	=	=	2b	4a	3·5b	=	·5b	3a	11·5b	5a	6b	8b	5·5a	1·2 below.		
" as it passes beneath the costal arch above or below E.F.,	·5a	3·5b	·5a	=	1·5a	2·5a	4b	1a	=	·5b	·5b	1·5a	3b	1a	6b	2·5b	=	2·5b	·5a	·5b	2·5b	1b	5b	3a	1·5a	=	=	1b	·5b	4a	3·5b	·5a	·5b	3a	4b	3·5a	3·5b	3b	4·5a	·5	"	(·48)	
³ " " in the middle line above or below E.F.,	1·5b	13b	2b	1·5b	2a	1a	7b	=	=	2·5b	3b	=	2·5b	3b	7·5b	4b	1·5b	=	2b	3b	2·5b	2·5b	1·5b	1b	1·5a	=	6b	·5b	2b	4b	4a	3b	3b	7b	1·5a	10b	2·5a	10b	6b	3·5a	2·5	"	(2·42)
⁴ " of the right extremity of the stomach from the middle line,	1	7·5*	1L	6	4·5	2·5	1·5	1·5	2	5	4	1	1·5L	5	=	2L	2·5	1	=	2·5	6	2L	2·5	2L	2	4	3·5	5	4	2	2·5	6·5*	3	9*	5	2·5	3	9*	3*	1·5	2·8		
⁴ " of the above point above or below E.F.,	1·5b	7·5b	2b	=	3a	=	6b	=	2b	·5b	1·5b	=	2·5b	1b	7·5b	4·5b	1b	=	2b	4b	=	3b	·5a	3b	1a	1b	3·5b	1b	1b	3b	4a	2·5b	2·5b	5b	=	7b	2·5a	3b	4b	2a	1·75 below.		
<i>The Liver.</i>																																											
<i>In connection with other Viscera</i>																																											
Distance of the lower border of the liver above or below the upper border of the pylorus in the same vertical plane,	·5a	1a	2b	·5a	4·5b	·5a	1b	=	1b	4·5b	3b	3b	1b	1·5b	3b	5·5b	1b	3·5b	1·5b	1b	1·5b	4·5b	1b	2·5b	2b	5b	·5b	6·5b	1b	2b	1·5a	3b	1b	4b	=	·5a	1·5b	2b	1·8 below.			
* Distance of the lower border of the liver above or below lesser curvature in the middle line,	=	1a	1b	2b	5b	·5a	=	1b	=	3·5b	2·5b	3b	3b	3·5b	3·5b	4b	1b	3·5b	2b	=	4·5b	3·5b	1b	2b	3b	3b	=	3b	·5b	1·5b	1·5b	3·5b	2b	...	1a	·5a	·5b	=	=	1·6	"	
² Distance of the liver to the left in the same plane as the "left point of the lesser curvature,"—more, m, less, —,	1m	=	5m	·5m	2·5m	2—	4·5—	1—	2—	1m	1·5m	=	1·5m	2·5m	7m	1·5—	1m	6·5m	·5m	1m	4m	·5m	3·5m	1—	4·5m	5m	1·5—	1m	2·5m	·5m	·5m	2m	11m	2·5—	1·5m	2—	3m	3m	=	1·43 more.		
<i>The Pancreas.</i>																																											
Distance of the upper border of the pancreas in the middle line above or below E.F.,	1·25a	2b	2a	6·5a	7a	6·5a	1b	4a	1a	6·5a	=	1·75a	·5b	3a	2·5b	1a	3·5a	3·75a	2a	2·5a	3·5a	2a	4a	2·5a	4a	3·5a	1·5a	3a	1·5a	·5a	4 5a	1a	1a	3·75a	3·5a	1a	3·5a	2·75a	·5a	5·75a	2·4 above.		
Distance of the upper border of the pancreas in the middle line above or below the lesser curvature,	·25a	3·5a	1a	1a	=	1·5a	3a	1a	2·5b	2a	2b	·75b	·5b	=	2a	2a	1a	·75a	·5a	·5a	1·5a	1·5a	1a	1·5a	=	=	2a	2b	4b	2a	2b	2·5b	1a	3·75a	2b	7a	3·5b	2·75a	1a	·25b	·5	"	
Distance of the anterior border of the pancreas in the middle line above or below E.F.,	2·5b	6·5b	2b	1·5a	4a	·5a	4b	=	1·5b	·5a	2b	·5b	3·5b	1·5b	Head only 9·5b	4b	1b	=	3b	3b	=	3·5b	1b	·5b	=	=	2b	1·5b	3b	2·5b	2a	2b	2b	=	=	3b	1·5a	·5b	4b	1·5a	1·5 below (1·48)		
Distance of the anterior border of the pancreas in the middle line above or below the greater curvature,	1b	6·5a	=	3a	2a	·5b	3a	=	1·5b	3a	1a	·5b	1b	1·5a	2b	=	·5a	=	1b	=	2·5a	1b	·5a	·5a	1·5b	=	4a	1b	1b	1·5a	2b	1a	1a	7a	1·5b	7a	1b	9·5a	2a	2b	1 above (·96)		
Distance of the anterior border of the pancreas in the left lateral line above or below E.F.,	=	6b	1·5a	3a	3a	4a	4·5b	2a	3a	3a	=	1a	·5a	1·5b	4b	=	·5a	1·5a	·5b	2a	2a	=	2a	1b	2a	1·5a	2b	1·5b	2b	1a	4a	2b	=	·5a	1a	3b	3·5a	·5a	3b	1a	·3 above.		
Distance of the anterior border of the pancreas in the left lateral line above or below the greater curvature,	1b	2·5a	1·5a	2·5a	1·5a	1a	6·5a	·5a	3a	3·5a	·5a	·5b	3a	2·5b	6a	2·5a	1a	1·5a	2a	=	·5b	6a	3a	6a	2b	·5b	1a	1·5b	2b	3a	=	1·5a	=	1a	2b	8·5a	1·5b	6·5a	5a	4·5b	1·5 above.		
Extent of the pancreas to the left of the middle line,	10	8	10·5	10	10	9	8	6·5	9·5	10	11	9	10	9	10·5	10·5	9·5	9·5	12	7·5	9	7·5	10	8·5	9	7·75	9	9·5	8	9	9	10	10	8	9	8	9	9·5	8·5	7	9·13		
" greater curvature to the left of the middle line in the same plane,	11	6·5	10	10	7·5	10·5	11	9·5	13·5	10	9·5	8	11·5	5	12	13·5	12	9	10·5	8·5	9·5	11	9·5	9	10	9·5	8	10·5	8·5	9	11	1											

¹ The central point of the cardiac orifice is taken.

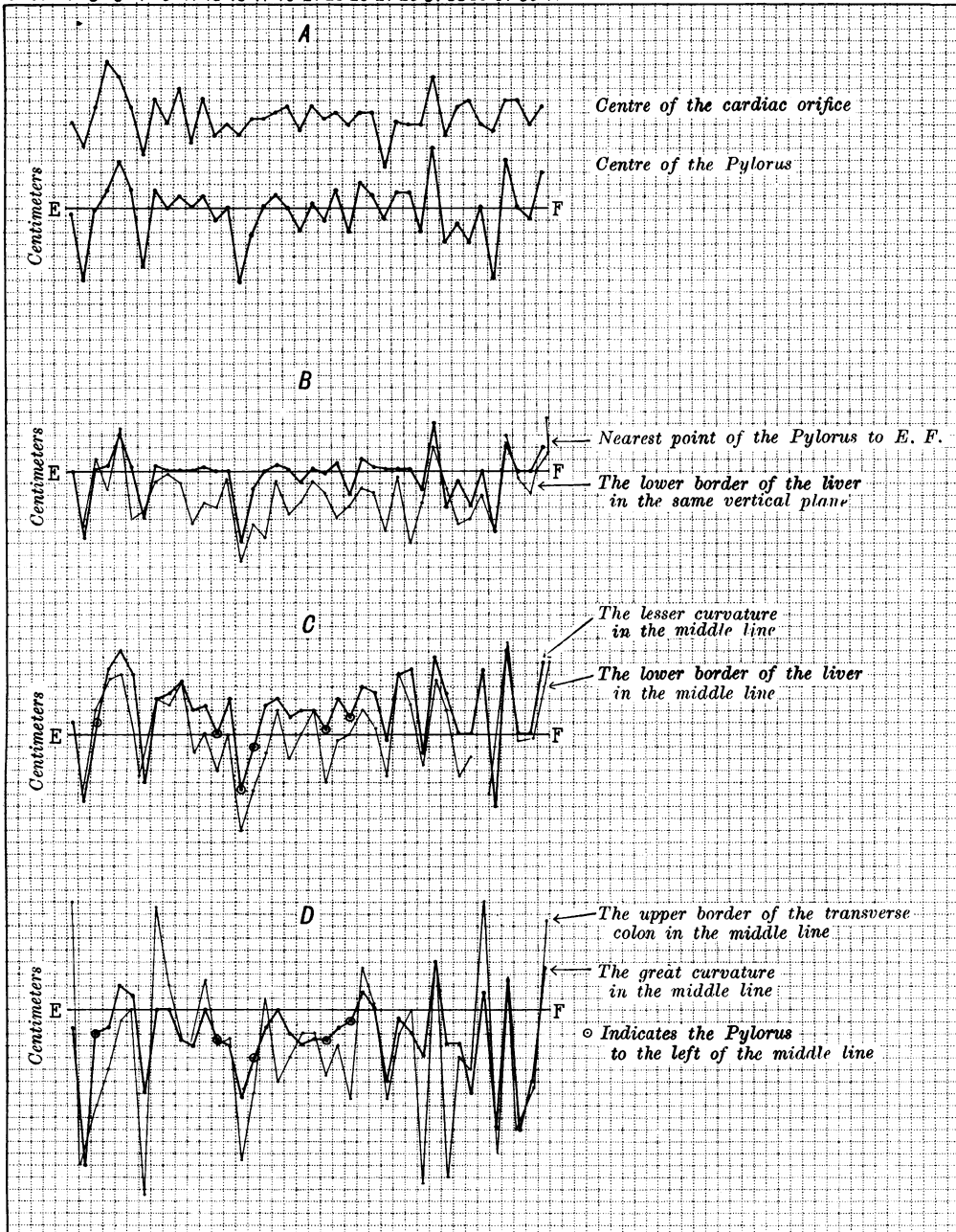
² The extreme left point of the lesser curvature in the plane nearest to E.F. is spoken of as the "left point of the lesser curvature." The "left point of the greater curvature" is the extreme left point of the greater curvature in the plane nearest to E.F.

³ In those cases in which the pylorus was to the left of the middle line the letter L, thus (L), is placed after the figures. In these cases also the upper and lower borders of the duodenum are reckoned in the tables as the lesser and greater curvatures respectively.

⁴ In most cases this signifies the lower border of the pylorus, but in those cases in which



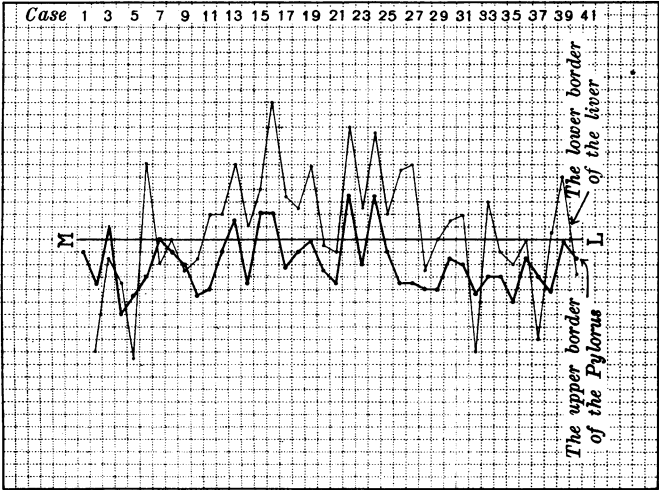
Case 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41



Illustrating various points in connection with the relation of the stomach to the liver and the transverse colon, and of the positions of its orifices.

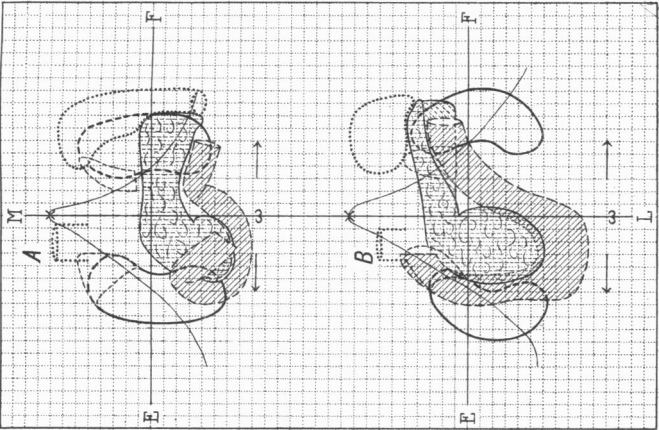
Fig. 2

The Scale represents Centimeters.



Showing the relations of the upper border of the pylorus and the lower border of the liver in the same horizontal plane to the middle line. (M.L.)

Fig. 1



A. Showing the position of the parts behind the stomach when the stomach is lowly placed—From Case 36.
B. The same : when the stomach is highly placed—From Case 37.